What is claimed is:

CLAIMS

1. An adaptive controller comprising:

a dither signal generator configured to generate a sequence of uncorrelated dither signals for each of a plurality of control signals and to apply the dither signals in parallel to all the control signals;

a performance measurement apparatus configured to measure a performance measure corresponding to each parallel application of control signals through the sequences and to store the resulting sequence of performance measurements;

a correlator configured to correlate the sequence of performance measures with each of the dither sequences to form a sequence of correlator outputs for each of the control signals;

an integrator configured to integrate each of the sequences of correlator output sequences; and

a control signal update device configured to add to or subtract from the control signal values the value of their corresponding dither signal, the adding or subtracting depending upon the value of the corresponding integrated correlator output.

2. The adaptive controller of claim 1 wherein the performance measurement apparatus is a forward error correction apparatus.

3. The adaptive controller of claim 1 wherein the performance measurement apparatus is a spectral shape measurement apparatus.

4. The adaptive controller of claim 1 wherein the performance measurement apparatus is a baseband eye pattern measurement apparatus.

5. An adaptive equalizer comprising:

a splitter connected to receive and split into portions a communications signal;

a plurality of gain controlled amplifiers each connected to receive and amplify one of said split portions of a signal;

a combiner connected to combine the amplified split portions of the signal;

a decision and eye monitor circuit connected to receive the combined signal and to produce an error signal; and

an adaptive controller configured to receive the error signal from the decision and eye monitor circuit and to produce control signals which control the gain of said gain controlled amplifiers, the adaptive controller comprising:

a dither signal generator configured to generate a sequence of uncorrelated dither signals for each of a plurality of control signals and to apply the dither signals in parallel to all the control signals;

a performance measurement apparatus configured to measure a performance measure corresponding to each parallel application of control signals through the sequences and to store the resulting sequence of performance measurements;

a correlator configured to correlate the sequence of performance measures with each of the dither sequences to form a sequence of correlator outputs for each of the control signals;

an integrator configured to integrate each of the sequences of correlator output sequences; and

a control signal update device configured to add to or subtract from the control signal values the value of their corresponding dither signal, the adding or subtracting depending upon the value of the corresponding integrated correlator output.

6. The adaptive equalizer of claim 5 wherein the performance measurement apparatus is a forward error correction apparatus.

7. The adaptive equalizer of claim 5 wherein the performance measurement apparatus is a spectral shape measurement apparatus.

8. The adaptive equalizer of claim 5 wherein the performance measurement apparatus is a baseband eye pattern measurement apparatus.

9. A method for adaptive control of a process comprising the steps of:

(A) simultaneously applying to a plurality of control signals corresponding members of sequences of uncorrelated dither signals;

(B) measuring the performance of the process corresponding to each simultaneous application of the dithered control signals and repeating the performance measurement through the sequential, parallel application to the control signals;

(C) storing the resulting sequence of performance measurements;

(D) correlating the sequence of performance measures with each of the dither sequences to form a sequence of correlator outputs for each of the control signals;

(E) integrating each of the sequences of correlator output sequences; and

(F) adding to or subtracting from the control signal values the value of their corresponding dither signal, the adding or subtracting depending upon the value of the corresponding integrated correlator output.

10. The method of claim 9 wherein the step (B) of measuring performance comprises the step of:

(B1) monitoring a forward error correction apparatus.

11. The method of claim 9 wherein the step (B) of measuring performance comprises the step of:

(B2) measuring the spectral shape of an output signal.

12. The method of claim 9 wherein the step (B) of measuring performance comprises the step of:

(B3) measuring a baseband eye pattern of an output signal.

13. A method for adaptive equalization comprising the steps of:

(A) receiving and splitting into portions a communications signal;

(B) amplifying with gain controlled amplifiers each of said split portions of a signal;

(B) combining the amplified split portions of the signal;

(C) receiving the combined signal and producing an error signal; and

(D) adaptively controlling the control signals which control the gain controlled amplifiers by:

(E) simultaneously applying to the plurality of control signals corresponding members of sequences of uncorrelated dither signals;

(F)measuring the performance of the process corresponding to each simultaneous application of the dithered control signals and repeating the performance measurement through the sequential, parallel application to the control signals;

(G) storing the resulting sequence of performance measurements;

(H) correlating the sequence of performance measures with each of the dither sequences to form a sequence of correlator outputs for each of the control signals;

(I) integrating each of the sequences of correlator output sequences; and

(J) adding to or subtracting from the control signal values the value of their corresponding dither signal, the adding or subtracting depending upon the value of the corresponding integrated correlator output.

14. The method of claim 13 wherein the step (F) of measuring performance comprises the step of:

(F1) monitoring a forward error correction apparatus.

15. The method of claim 13 wherein the step (F) of measuring performance comprises the step of:

(F2) measuring the spectral shape of an output signal.

16. The method of claim 13 wherein the step (F) of measuring performance comprises the step of:

(F3) measuring a baseband eye pattern of an output signal.

17. The method of claim 16 wherein the step (E) of applying a dither signal includes the step of:

(E1) generating a dither sequence for each of a plurality of control outputs using a different code sequence for each of the control parameters, each of the codes sequences being substantially orthogonal to every of the other code sequences.

18. The method of claim 17 wherein the step (E1) of generating a dither sequence includes the step of:

(E2) employing finite length orthogonal codes for the code sequences.

19. The method of claim 17 wherein the step (E1) of generating a dither sequence includes the step of:

(E3) employing Walsh codes for the code sequences.